

RESOLVE, a Macintosh-based Generic Decision Tree Program*

David L. Ingram, MD¹
Stephen M. Downs, MD, MS²
Robert A. McNutt, MD³

¹Duke-UNC Training Program in Medical Informatics

²Department of Pediatrics

³Department of General Medicine

University of North Carolina School of Medicine
Chapel Hill, NC 27599

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Abstract

RESOLVE is a Macintosh-based decision analysis program which utilizes a prototypical decision tree, permitting non-expert analysts to perform and understand clinical decision analyses. Users are prompted for appropriate data (probabilities, utilities, risks, benefits) using an interactive, mouse-driven interface. Analysis is performed in the background, and results are presented in an intuitive, graphic display. The user may compare therapeutic options by Life Expectancy (LE), Quality of Life (QOL), or Quality-adjusted Life Expectancy (QALE). On-line help screens explain unfamiliar terms and concepts and guide the user through the analysis. In addition to enabling more widespread use of decision analysis techniques, RESOLVE teaches users to look at problems in a comprehensive and analytic manner.

Introduction

Medical decision making is often difficult. While many clinical decisions are straightforward, others may present significant challenges. Incomplete information, multiple variables, pervasive uncertainty and high stakes can combine to tax even experienced clinicians.

Decision analysis is a powerful tool developed in the late 1940's as a means of making rational, consistent decisions in the midst of a complex environment. This method has been increasingly utilized in the medical domain in the last two decades, but usually only in the hands of scarce experts. Practical use has generally been limited to academic exercises and policy making. Difficulties in learning and applying the techniques of decision analysis, as well as the time needed to perform such analyses, have hindered more widespread use of these methods in clinical medicine.

We have created a program to enable non-expert clinicians to perform decision analyses on a real-time basis in the clinical environment, and also to aid in understanding the implications of the analysis results.

System Overview

RESOLVE is a stand-alone application created in Aldus Supercard™, a 4th generation development system, with external source code written in Think C™ (Symantec Corp.).

The program implements a prototypical decision tree which considers three therapeutic options: empirical treatment; diagnostic testing followed by either treatment or observation; and observation without testing or treatment. The tree models complications of treatment and testing, as well as changes in Life Expectancy (LE) and Quality of Life (QOL) with and without treatment.

The user is presented with a sequence of screens which gather information necessary to perform the analysis. Examples include: names of diseases and therapies, disease prevalence, test sensitivity and specificity, assessment of LE with and without therapy, changes in QOL, and risks of test and treatment complications. Definitions and explanations of these variables are provided using help screens.

These and other data are incorporated into the decision tree and a decision analysis is performed in the background. Analysis results are presented as threshold bars[1]. Each threshold bar is a linear scale, showing the optimal therapeutic strategy for all possible values of a given variable. The baseline value given by the user is marked on the scale. In this manner, the user is shown the best therapeutic option. Moreover, the user can explore the circumstances in which an alternative strategy may be better.